

REMARKS

A. Background

Claims 1, 3, 4, and 16-21 were pending in the application at the time of the Office Action. All of the pending claims were rejected as being obvious over cited art. By this response applicant has canceled claims 3, 4, and 17-19; and amended claims 1 and 16. As such, claims 1, and 16, 20, and 21 are presented for the Examiner's consideration in light of the following remarks.

B. Proposed Claim Amendments

Applicant has herein amended claims 1 and 16 to further clarify, more clearly define, and/or broaden the claimed inventions to expedite receiving a notice of allowance. Specifically, claims 1 and 16 have been amended to respectively incorporate the limitations of canceled claims 3 and 17, and to recite that the doping concentration of the dopant is greater than or equal to $2 \times 10^{19} \text{ cm}^{-3}$ such that said n-type over-cladding layer is hardly grown in the substantially level region. The amendments to the claims are supported in the application at least by Figure 1F and paragraph [0035] of the specification as amended in a previous paper. In view of the foregoing discussion, applicant submits that the amendments to the claims do not introduce new matter and entry thereof is respectfully requested.

C. Rejection Based on 35 USC § 103

Pages 3-5 of the Office Action reject claims 1, 3, 4, and 16-21 under 35 USC §103(a) as being obvious over Japanese Publication No. 03-053582 to Takahiro et al. ("*Takahiro*") in view of U.S. Publication No. 2004/0057483 to Takemi et al. ("*Takemi*") and further in view of U.S. Publication No. 2002/0168856 to Iga et al. ("*Iga*"). Inasmuch as claims 3, 4, and 17-19 have been canceled herein, the rejection of those claims has been rendered moot and should be withdrawn. Regarding the rest of the rejected claims, Applicant respectfully traverses this rejection. Of the rejected claims, claims 1 and 16 are independent claims.

One of objects of the present invention is a reduction of a capacitance of a directly modulated laser so as to operate the laser at a higher temperature and a higher speed. See paragraph [0004]. In Embodiment 1 of the present application, when a doping concentration of Se for the n-type InP over-cladding layer is $6 \times 10^{18} \text{ cm}^{-3}$, a 3-dB bandwidth of the optical-signal

response characteristics of the laser is about 25 GHz at a chip temperature of 25 °C. See paragraphs [0029] and [0032]. When the doping concentration of Se is $8 \times 10^{18} \text{ cm}^{-3}$, the 3-dB bandwidth of the laser is about 28 GHz at a chip temperature of 25 °C. See paragraph [0034]. When the doping concentration of Se is $2 \times 10^{19} \text{ cm}^{-3}$, the 3-dB bandwidth of the laser is about 30GHz at a chip temperature of 25 °C. See paragraph [0035]. As the above demonstrates, it is clear that the capacitance of the laser is reduced by increasing the doping concentration of Se so that the 3-dB bandwidth is spread.

Applicant notes that the reason for this is because the n-type InP over-cladding layer is not grown on the current-blocking layer as the doping concentration of Se increases. Regarding the relationship between the doping concentration of Se and the degree of flattening shown in Fig. 2B, the n-type InP over-cladding layer is hardly grown on the current-blocking layer when the doping concentration of Se is equal to or higher than $2 \times 10^{19} \text{ cm}^{-3}$. See paragraph [0035].

As discussed above, the thickness of the n-type InP over-cladding layer is reduced while the thickness of the current-blocking layer is increased. Thus, a sufficient thickness of the current-blocking layer and the large flattening effect of the over-cladding layer can prevent the degradation of the device characteristics. Applicant submits that *Takahiro* fails to disclose or suggest an over-cladding layer that is not grown on a level portion of the current-blocking layer as the doping concentration of Se increases. Applicant further submits that neither *Takemi* nor *Iga* cure this deficiency of *Takahiro*.

In light of the above, Applicant submits that none of the cited art, taken individually or combined, teach or suggest an n-type over-cladding layer “wherein the doping concentration of Se is greater than or equal to $2 \times 10^{19} \text{ cm}^{-3}$ such that said n-type over-cladding layer is hardly grown in the substantially level region,” as recited in amended claims 1 and 16. Accordingly, Applicant respectfully requests that the obviousness rejection with respect to claims 1 and 16 be withdrawn.

Claims 20 and 21 depend from claim 16 and thus incorporate the limitations thereof. As such, applicant submits that claims 20 and 21 are distinguished over the cited art for at least the same reasons as discussed above with regard to claim 16. Accordingly, Applicant respectfully requests that the obviousness rejection with respect to claims 20 and 21 also be withdrawn.

No other objections or rejections are set forth in the Office Action.

E. Conclusion

Applicant notes that this response does not discuss every reason why the claims of the present application are distinguished over the cited art. Most notably, applicant submits that many if not all of the dependent claims are independently distinguishable over the cited art. Applicant has merely submitted those arguments which it considers sufficient to clearly distinguish the claims over the cited art.

In view of the foregoing, applicant respectfully requests the Examiner's reconsideration and allowance of claims 1, 16, 20, and 21 as amended and presented herein.

The Commissioner is hereby authorized to charge payment of any of the following fees that may be applicable to this communication, or credit any overpayment, to Deposit Account No. 23-3178: (1) any filing fees required under 37 CFR § 1.16; (2) any patent application and reexamination processing fees under 37 CFR § 1.17; and/or (3) any post issuance fees under 37 CFR § 1.20. In addition, if any additional extension of time is required, which has not otherwise been requested, please consider this a petition therefor and charge any additional fees that may be required to Deposit Account No. 23-3178.

In the event there remains any impediment to allowance of the claims which could be clarified in a telephonic interview, the Examiner is respectfully requested to initiate such an interview with the undersigned.

Dated this 17th day of September 2009.

Respectfully submitted,

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